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so that at the same time of year they run together nearly for several succeeding years.

Hence the observations do not readily discriminate between them; but those at 2416820, 2417176, and 2417178, when the nucleus was faint, seem to favour the $27\frac{1}{3}$ day period, since they make the epochs 10 or 12 days away from maximum, while the $25\frac{1}{2}$ day period makes them close to maximum. Professor Barnard proposes to make further observations to settle the question.

Corrections to Professor Turner's Paper "On the Classification of Long-period Variable Stars, and a possible Physical Interpretation." By the Rev. J. Stein, S.J., Sc.D.

(*Communicated by Professor H. H. Turner, D.Sc., F.R.S.*)

[My best thanks are due to Father Stein for pointing out the corrections noted below. According to the general permission given in the last sentence of his letter, I publish it at once.—H. H. T.]

Specola Vaticana, April 3, 1908.

Dear Professor Turner,—Lately I have studied your remarkable article on the "Long-period Variable Stars" (*M.N.*, lxvii. p. 332). My interest was the greater as this is the first serious attempt to bring the long-period light-curves in close relationship to the laws of sun-spot variation.

I take the opportunity for suggesting some ideas by which the number of possible cases in your hypothesis may be still more reduced.

1°. Is there not a little oversight in your paper on page 345? There it is said—

"The mean (foreshortening) factor for the spot may be taken as

$$\int \cos \zeta \, dZ = \ldots \text{"}$$

Should this not be

$$\frac{\int \cos \zeta \, dZ}{\int dZ}\,?$$

Then "the total effectiveness" would be (*top line of page* 346)—

$$s = \frac{1}{2\pi}(4\beta \cos \epsilon \sin \lambda + 4 \cos \beta \sin \epsilon \cos \lambda),$$

and in the "polar view"—

$s_1 = \sin \lambda$ (as correctly stated on page 342, line 6; but not as incorrectly on page 346).

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In the "equatorial view"—

$$s_2 = \frac{2}{\pi} \cos \lambda \ (\textit{instead of } 4 \cos \lambda \textit{ on p. } 346).$$

Thus $s_1 = s_2$ for $\tan \lambda = \frac{2}{\pi}$, or

$$\lambda_0 = 32°·5,$$

and λ_0 *is defined without any ambiguity*, such as is contemplated on p. 348. Of course, if we take a broad belt of sun-spots instead of an infinitesimal one, λ_0 will be slightly different from the given value. In the extreme case, when the whole sphere is all over covered with spots, the mean foreshortening factor will be $\frac{(\text{Disc})}{(\text{Hemisphere})} = \frac{1}{2}$, and $\lambda (= \lambda_0) = 30°$. The variation of λ_0 being so slight, we can practically put $\lambda_0 = 30°$ for all cases.

2°. The brightness at maximum being from 40 to 100 times that at minimum, it seems very probable that at maximum the whole surface of the star is in activity and covered with faculæ. This may be confirmed by what we know of the "polar type" of the Sun's corona at maximum, when the streamers are numerous in nearly all solar latitudes (*M.N.*, lxiii. p. 482), in opposition to the "equatorial" or "wind vane type" at minimum. In this hypothesis the maxima of polar and "equatorial view" must coincide, and this would seem a new argument for the more preferable "hypothesis of superposing maxima."

If these remarks are right, it follows that the latitudes given on page 348 for $\lambda_0 = 30°$ are the most probable.

Now, starting from the equation $B = sF$, we can calculate F.

Subtracting the numbers of Table III. Group I. (the "polar view group") from unity, and multiplying by 1·6, we get

	Max.	2	3	4	5	6	7	8	9	10	11	12
log s_1 F =	1·60	1·39	·99	·63	·21	·00	·10	·48	·96	1·12	1·33	1·44
log sin λ =	9·70	9·62	9·45	9·28	9·13	9·19	9·52	9·91	9·99	·00	9·99	9·93
log F =	1·90	1·77	1·54	1·35	1·08	0·81	0·58	0·57	0·97	1·12	1·34	1·51
F =	79	59	35	22	12	7	4	4	9	13	22	32
λ =	30°	25°	16°	11°	8°	9°	19°	54°	79°	82°	78°	58°

The hypothetical law suggested by these numerical results can hardly be better expressed than in the words used by the Astronomer Royal for characterising the sun-spot phenomena from 1874 to 1902 (*M.N.*, lxiii. pp. 452–3). We have only to omit the words between brackets :— . . . "The years of maximum showed spots in practically every latitude [between 30° N and 30° S]. In the years following the maximum a marked tendency was shown for the spots to appear in lower latitudes . . . . about one or two years before minimum no spots were seen outside the limit of 18° from the equator. But immediately minimum was reached the

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spots became more widely extended in latitude, owing to the occurrence of outbreaks in high latitudes. Thus at minimum each hemisphere, considered separately, showed two clearly defined spot-zones marked off from each other by a broad belt in which there were no spots at all. Of these two spot-zones in each hemisphere, the lower appears to correspond to the series of spots of the expiring cycle. During the periods of increase the equatorial belt was almost wholly free from spots, indicating possibly the complete disappearance of the last members of the old cycle. At maximum, however, the spots of the new cycle were most widely spread, and were even seen in the near neighbourhood of the equator . . . ."

Finally, I wish to tender you my sincere congratulations on your original interpretation of the long-period variation, and to express the hope that my little remarks may contribute to enhance its evident plausibility.

It goes without saying, that you may dispose of these remarks at your own pleasure.—I am, very faithfully yours,

J. Stein, S.J.

Measures of Southern Double Stars in 1907. By James L. Scott.

The following measures of southern double stars were made with the same 5-in. refractor as those in *M.N.*, vol. lxiv. p. 52, bright wire illumination being used throughout. The weather during 1907 was, on the whole, distinctly poor, cloudy nights and bad definition being the rule rather than the exception; the number of stars measured was therefore smaller than usual.

Star's Name.	R.A.	S. Dec.	P.A.	Distance.	Mags.	Nights.	Date.
	h m	′	°	″			1907.
Σ 3063	0 2	5 6	218·0	1·85	8½ 10	3	·942
O. Stone 51	0 2	14 54	288·6	9·88	9 9	2	·942
β 391 (κ_1 Sculptoris)	0 3	28 32	270·8	1·15	6½ 6½	3	·928
h 3375	0 29	35 32	166·3	6·05	6½ 9	2	·868
O. Stone 3	0 47	23 9	267·2	2·10	8¾ 9½	3	·953
h 3407	0 48	25 31	127·3	13·20	7 7¼	2	·871
Ll. 1662	0 53	16 13	214·8	6·50	8 8¼	2	·006
h 2036	1 15	16 20	13·3	1·48	7 7¼	3	·956
τ Sculptoris	1 32	30 25	97·2	1·90	6 7	3	·953
Σ 231 (66 Ceti)	2 08	2 52	232·0	16·05	5¾ 8¾	2	·956
Hastings I	2 11	18 42	356·1	2·01	8 8½	3	·956
θ Eridani	2 54	40 43	86·1	8·46	3¼ 4¾	2	·953
h 3750	5 16	21 20	279·8	3·50	4¾ 9½	2	·164
h 3752	5 18	24 52	102·7	3·25	5½ 7½	2	·164